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THE influence of schools upon the spread of infectious diseases, and the need for the exercise of greater public care over the schools, have been much discussed within the last few years, and with nearly unanimous conclusions. I think we should all agree upon the fact that the collection of large numbers of people within small spaces, generally speaking, furnishes the most favorable opportunity for the spread of infectious diseases, but more particularly with school children whose susceptible age and familiar habits render them unusually liable to the incidence and extension of these diseases. We shall also agree that the infective agent is frequently present in our public schools and that it only remains to be shown by what means the infection is conveyed.

For the purposes of this brief paper we shall need to consider but two of the most common and dreaded infectious diseases—diphtheria and scarlet fever, and perhaps diphtheria alone would be sufficient.

It was thought from the beginning of our knowledge of diphtheria until within a few years, that it belonged in the list of what has been termed filth diseases, and with this view in mind Boards of Health followed out different lines of work for the purpose of proving or disproving the theory that this disease might be caused by any unsanitary conditions.

In 1878 the Board of Health, with which I am identified in Boston, called for reports of cases of diphtheria, and for the last nineteen years we have examined every house in which a case of diphtheria was reported, and amongst other reasons to see what connection filth and defective drainage within buildings had with the prevalence of this disease, but with such negative results as to warrant the belief that it is scarcely, if at all, more likely to occur in the poorly constructed and badly kept houses than in the best. The percentage of defects found in connection with cases of diphtheria is found to be but slightly greater than that found when examining from house to house where no disease or complaint has occurred.

In 1882 we made an investigation to ascertain what connection there might be between cases or groups of cases of diphtheria and street gullies, perforated sewer covers, sewer outfalls, proximity to tide water flats, low damp ground and high ground. Here again we found not even a suspicion of relation between cases of diphtheria and any of the suspected causes. On the other hand we are continually reminded of the unmistakable direct or indirect connections between new cases of these diseases and other infected persons or rooms and articles which have become infected. We are forced to believe that the means by which children afflicted with diphtheria may and do create foci of infection in our school buildings as well as in their homes, and the facilities by which others may take on the infection from such foci, are both natural and easy. I think we are warranted in this belief by every process of reasoning and upon the facts connected with the disease. Diphtheria is, unquestionably, an infectious disease and may be communicated directly from person to person, or indirectly through some intermediate object upon which the infective matter may have been lodged and where it may remain active for a longer or shorter time. The local manifestation of

diphtheria is nearly always in the throat, where we have the bacilli of the disease in abundance, mixed with the secretions of the throat and mouth, and in the most convenient form to be transferred to any surrounding object. This infective matter is easily scattered and attached to things by coughing, sneezing and spitting, or by the fingers which perform a continual messenger service between the month and whatever may be touched within the reach of such fingers. We have, for instance, a child suffering from diphtheria in school, not ill enough to attract special attention. He may be there for a day or two before the disease is discovered, with a mild, unrecognized case, or he may be there for a much longer time, in a condition for spreading the disease. During this time he may attach the infective matter to the desk, chair, books, slate, slate-pencil, lead-pencil, pen-holder, sponge, drinking cup, door-knob, door, window sill, banister, wainscotting, or to anything else which he may handle or touch after using his fingers about the mouth. The fact that these things may become infected with diphtheria in this way has been conclusively shown in the laboratory by Professor Ernst.

In kindergarten schools the danger of spreading the disease by a single case is much greater, both by direct and indirect infection, because these children by virtue of the different processes of teaching are brought into much closer contact with each other, and they use a large number of objects in common which are very liable to become infected. One unrecognized case under such circumstances may give rise to a dozen more, and without our being able to trace one of them to its particular source.

The following account of a kindergarten teacher may be of interest at this point:

"Regarding the contact of children with each other in kindergarten and the interchangeable use of material, it is

as follows: The chairs for seating the children are small portable ones. These are carried from one place to another as the classes need them; no one chair is allotted to any particular child, all are used in common. The tables at which the children sit are long enough for four or five children to sit at each. It is impossible to arrange so that each child may have the same chair or the same place at the table regularly. The material used is such that it is almost impossible to let one child use any portion of it solely as his. We have but two dozen worsted balls with which to teach color, form and direction; and we have seventy children to use the ball. It is the same with everything else. The blocks used are handled by two or three classes during the same day. The iron rings, wooden sticks, wooden planes, paste-board tablets, wooden beads, weaving needles and worsted needles are all used in common. The napkins used at lunch time are washed once a week and taken out before then if really soiled, otherwise they are folded and returned to the drawer ready for the next day. The picture books are enjoyed by all and the dolls are used at every recess. In playing the games the children stand holding hands on the ring, and when there is good attendance they are crowded.

Many of the games bring them very close together, for instance:

In playing the 'Birds Nest' the mother bird chooses six or more children who kneel upon the floor in a semicircle, she twines their arms about each other to imitate weaving the nest. She then chooses three children who are put close together, necessarily, in the nest and then the game proceeds. This is a typical bird game and is very pretty, but in time of epidemic of throat diseases we do not like to play it in our kindergarten as it brings the heads so near each other. There are other games, of course, which do not need such close proximity as the one described, but all the games are for two or more children to take part in and they are generally in contact in some way if only holding hands."

Numerous instances have come under our observation where a child has been found in school suffering from an

infectious disease by the medical inspector of schools, and sent home; this case has been followed in due time by other cases in children whose only discoverable exposure was that which occurred in the school room. Fresh evidence of such exposure and of its effects has been brought to my attention within a few weeks occurring in the service of Dr. Arnold, one of our school inspectors. An epidemic of diphtheria occurred in a primary school in which there were forty pupils, fourteen of whom were attacked with diphtheria within a period of eighteen days, all from one room. Of the fourteen cases seven were discovered by the school inspector and three of these only by cultures. All suspicious cases were dismissed from school May 5th, and recommended to the care of their family physicians. The next morning every pupil was examined and many cultures were taken. The class was then dismissed from Thursday to the following Monday, the room disinfected and cleaned up. For ten days after their return the throat of every pupil was examined by the medical inspector when they first assembled in the morning, and no pupil who had been absent with any suspicious symptoms was allowed to return until it was proved by a negative culture that there could be no danger. As a result of these measures not a single case of diphtheria resulted beyond those known to have been infected at the time the epidemic was discovered. A similar experience with scarlet fever occurred in the service of the same school inspector within two weeks, in which eleven cases resulted from the presence in school of one pupil whose illness had been attributed to German measles.

The following tables give the number of cases of diphtheria and scarlet fever reported in Boston, by months for nineteen years and twenty years respectively, and show that when the schools are in session the number of cases is much greater than during vacation time.

Cases of diphtheria reported each month for nineteen years:

Years.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1878	241	178	135	102	58	114	65	44	87	106	98	125
1879	155	111	82	108	87	111	53	37	53	100	132	146
1880	167	141	112	101	143	126	100	74	105	150	238	258
1881	179	163	190	140	142	143	108	85	103	162	135	130
1882	136	117	99	92	103	111	56	56	54	119	188	244
1883	170	132	100	98	140	94	64	72	88	126	150	175
1884	130	90	87	81	111	95	50	61	77	130	137	163
1885	164	117	108	109	101	108	85	54	64	123	119	111
1886	122	104	110	66	73	94	75	78	85	130	111	140
1887	128	93	96	101	75	68	53	40	53	112	100	130
1888	112	80	105	107	142	110	97	92	95	143	156	172
1889	179	150	193	205	190	165	93	99	99	137	130	174
1890	203	189	156	164	144	114	73	69	75	96	75	117
1891	80	71	59	71	81	49	31	36	40	78	180	127
1892	102	108	114	135	107	77	76	78	79	144	185	175
1893	152	114	116	70	86	111	88	102	89	194	160	183
1894	195	128	185	139	187	167	138	154	249	450	558	469
1895	343	296	205	185	225	328	268	278	345	415	635	564
1896	381	403	302	304	346	352	300	256	296	461	498	466
Total,	3339	2794	2554	2378	2541	2537	1873	1765	2136	3376	3913	4059

Cases of scarlet fever reported each month for the last twenty years:

Years.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1877	262	227	181	176	117	67	28	25	16	61	70	104
1878	161	99	73	48	35	47	25	36	43	67	94	119
1879	131	108	190	93	82	32	27	47	55	57	65	63
1880	60	36	47	29	32	35	19	10	29	44	89	67
1881	58	28	52	51	41	44	17	11	17	16	19	29
1882	65	41	49	36	70	61	26	41	37	48	102	104
1883	123	82	83	104	101	103	65	89	85	214	168	195
1884	209	186	197	239	215	173	214	209	175	242	224	242
1885	232	131	182	159	160	135	85	56	87	153	148	137
1886	155	126	144	151	115	99	56	52	43	58	82	68
1887	97	76	101	102	98	62	29	51	142	207	320	268
1888	146	119	100	75	70	20	19	11	16	52	29	40
1889	48	29	77	59	53	34	15	15	17	32	36	49
1890	98	103	105	122	118	74	72	30	20	30	40	112
1891	109	95	108	151	159	97	49	40	56	67	136	260
1892	290	291	447	335	370	217	124	86	100	183	226	269
1893	282	190	228	245	203	144	144	140	179	304	283	238
1894	214	169	168	199	266	205	109	135	125	182	192	278
1895	231	174	184	139	137	123	94	82	91	127	120	113
1896	136	99	104	108	77	113	72	42	53	81	157	176
Total,	3107	2409	2820	2621	2519	1885	1289	1208	1386	2228	2600	2931

It will be seen by an examination of the table for diphtheria that the average number of cases reported for each of the eight school months is 2,772, and for the four months of little or no school it is 2,077. In the table for scarlet fever it will be found that the average number of cases reported for each of the eight school months is 2,779, and for the four summer months it is but 1,191.

We do not claim that the closing of the schools is the only cause for the largely diminished amount of scarlet fever and diphtheria, but we believe that it is one of the important factors. Owing to the evident spread of scarlet fever and diphtheria in the schools, we recommended, in 1882, that the school-houses be thoroughly disinfected once in two weeks. This proposition was rejected, however, on the grounds that it would cost from $5,000 to $6,000, would be a hardship to the janitors, and that it might not effectually prevent the spread of the disease. From time to time since that date we have recommended to the School Board the need of frequently cleaning and disinfecting such parts of the interior of school buildings as might become infected, and that the use of many objects in common use among the children and which might easily become sources of infection, be discontinued. A few of these recommendations have been adopted. In 1890 the Board of Health proposed to furnish the schools with daily medical inspection with a view to discovering the earliest symptoms of infectious diseases among the children, by examining all cases of children sick or complaining from any cause in the schools, and giving to the teachers such professional advice as is constantly needed for the disposition of such children. After four years of unsuccessful efforts the Board succeeded, under the influence of a severe epidemic of diphtheria, and began the work November 1st, 1894.

The Board of Health divided the city into fifty districts,

giving an average of about four school-houses and fourteen hundred pupils to each district. No difficulty was experienced in finding well qualified and discreet physicians who would undertake the duties prescribed; and the Board selected and appointed one physician for each district with a salary of $200 a year. His duty is to make a visit to each master's school daily, soon after the beginning of the morning session. The master receives from each of the teachers in his district early reports as to the appearance of illness in any pupil in his charge. These reports are given to the visiting physician, who at once examines the reported children and makes a record of his diagnosis and action in books furnished by the Board of Health for this purpose and kept in the custody of the master. If the visiting physician finds the child too ill, from any cause, to remain in school, he advises the teacher to send the child home for the observation and care of its parents and family physician. If the illness is from a contagious disease the child is ordered home and the case reported to the Board of Health. The disposition of the sick child while at home, and the proper isolation in cases where contagious diseases develop in such children, as well as giving them a warrant for returning to school, depends principally upon the report of the school inspector.

In the examination of the children in school every facility is extended to the doctor by the teachers, and he in turn reaches a satisfactory conclusion with the least possible delay or annoyance to any one. There being frequent need for looking into the children's throats, we provided the inspectors with something for a tongue depressor which could be used once and destroyed, and thus get rid of the danger of communicating any disease from one pupil to another, and avoid unfavorable criticism on that score. I have some of them here to show you. These little pieces of clean pine are made for us at a cost of one-tenth of a cent each.

They are without objection in use or appearance, and will burn as easily as a match, which is the intended destiny of each after being used once. The thermometer is rarely a necessity in these examinations, and when used is treated with due care.

The school inspectors do not give professional treatment in any case. They merely point out the need of professional treatment where the need exists. The treatment itself must be received from the family physician, or in the hospitals, or in the dispensaries, and great care is necessary to avoid giving offence to physicians and their families.

It should be remembered that the Boards of Health of this State are authorized and required by statute law, to take charge of any case of contagious or infectious disease which may be dangerous to the public health; and while it is preferred that many cases should remain at home and be cared for by the family and the family physician, their isolation at home must be satisfactory to the Board of Health, and so certified by a medical agent of the Board. So also in the discharge of such patients from isolation, the evidence of their freedom from the disease, and the safety of their return to school or to the public, must be satisfactory to the Board of Health and come from its medical agent. For this duty the same medical inspectors are serving as agents of the Board of Health in the control of infectious diseases which are treated at home. We send to each of the school inspectors every morning a bulletin of the cases of diphtheria and scarlet fever which have been reported during the previous twenty-four hours. Each medical officer selects the cases reported in his district, visits them to see if they are properly isolated, leaves a card for the attending physician informing him of the official visit, and reports his approval or disapproval of the patient's isolation at once to the Board of Health. If the patient is properly isolated the inspector places a card on the door of the room to indi-

cate the official designation of the room for the isolation of the patient. If the case is not properly isolated, and it cannot be commanded at home, he reports the fact to the Board of Health, and such patient is taken to the hospital. He makes another visit to the patient on the question of discharge from isolation, and again reports to the Board of Health. If it is a case of diphtheria a negative report from the laboratory to the Board of Health is necessary, and if it is a case of scarlet fever desquamation must have ceased, and the fact certified by the agent before such patient can lawfully be released from isolation. The agent of the Board is thus held responsible for the proper isolation of the patient at home, for recommending the patient's removal to the hospital when necessary, and for the patient's release from isolation. In other words, the Board of Health is provided with trustworthy information upon which it can act for the best protection of the schools and the public against the spread of infectious diseases.

This corps of inspectors has become an organized association, which meets once in two months, to discuss the manifold medical questions which arise in the performance of their duties.

The whole number of children examined in 1896, and found to be ill, was 8,964. The diseases of which the children were suffering were classified as follows:

Specific Infectious Diseases,	267
Oral and Respiratory Diseases,	3,934
Ear Diseases,	66
Eye Diseases,	382
Skin Diseases,	628
Miscellaneous Diseases,	3,687

Those who were found to be suffering from infectious diseases were, as a rule, unaware of the fact, owing to the early stage of the disease or to the mildness of the attack. Occasionally one is found who has been prematurely re-

leased from care. All, however, were in a condition to spread the disease from which they were suffering.

There are about 85,000 pupils and over 1,500 teachers in the public schools, and about 13,000 pupils in the parochial schools of Boston which furnishes a wide field and the best opportunity for the exercise of professional observation and sanitary precautions against the diseases of childhood incident to school attendance. This work has now been in successful operation in Boston for two years and seven months, has constantly grown in favor in the medical profession, among the school teachers and in the community at large. There is every reason to suppose that under the influence of this daily medical attention every teacher will become more interested and expert in the outlook for and detection of any existing illness amongst the children under his or her care. Every parent may feel that his child is less exposed to disease while in school, and less likely to be ill without immediate attention from teacher or physician than was formerly the case.

This is the first work of its kind performed in this country, and, so far as I am able to learn, in the world. The nearest approach to it is done in Brussels where, under the control of the Bureau of Hygiene, school doctors are employed, and to whom the pupils are sent when suspected of being ill with infectious diseases. Our work has been recently copied in many places in this country, including the city of New York, where it has been employed for the last three months with complete satisfaction.

I am satisfied that it would be hard to find a field for medical inspection and supervision which presents equal facilities for the early detection of diseases, or which offers more satisfactory results.